

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

RECEIVED
CENTRAL FAX CENTER
NOV 17 2006

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

Claims 1-153 (canceled)

154. (Previously presented) A carbon black product having an organic group attached to the carbon black, obtained by a process comprising the step of reacting at least one diazonium salt with a carbon black in a protic reaction medium, wherein said diazonium salt is generated *in situ* from a primary amine, the protic medium is an aqueous medium, and the primary amine is an amine of the formula A_yArNH_2 , in which:

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical;

and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl, branched or unbranched C₃-C₂₀ unsubstituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;
- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

phosphonate salt, $\text{N}=\text{NR}$, N_2^+X^- , NR_3^+X^- , PR_3^+X^- , S_kR , $\text{SO}_2\text{NRR}'$, SO_2SR , SNRR' , SSO_3H , a SSO_3^- salt, SNQ , SO_2NQ , CO_2NQ , $\text{S-(1,4-piperazinediyl)-SR}$, 2-(1,3-dithianyl) , $\text{2-(1,3-dithiolanyl)}$, SOR , and SO_2R ; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

155. (Original) The carbon black product of claim 154, wherein

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;

U.S. Patent Application No. 10/806,080
 Amendment dated November 17, 2006
 Response to Office Action dated September 11, 2006

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and
- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

156. (Original) The carbon product of claim 154, wherein

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical;

and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR),

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

157. (Original) The carbon black product of claim 154, wherein

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical;

and

A, which can be the same or different when y is greater than 1, is a functional group selected from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl, branched or unbranched C₃-C₂₀ unsubstituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;

158. (Previously presented) A carbon black product, having an aromatic group attached to the

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

carbon black, obtained by a process comprising the step of reacting at least one diazonium salt with a carbon black in a protic reaction medium, wherein said aromatic group is a group of the formula A_yAr, in which:

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical;

and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl, branched or unbranched C₃-C₂₀ unsubstituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

wherein R and R', which can be the same or different, are hydrogen; branched or

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

159. (Original) The carbon black product of claim 158, wherein

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical;

and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

or more of said functional groups and/or halogen(s);

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

160. (Original) The carbon black product of claim 158, wherein

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical;
and

A, which can be the same or different when y is greater than 1, is independently a
substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

wherein R and R', which can be the same or different, are hydrogen; branched or

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

161. (Original) The carbon black product of claim 158, wherein

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical;

and

A, which can be the same or different when y is greater than 1, is a functional group selected from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl, branched or unbranched C₃-C₂₀ unsubstituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;

162. (Original) The carbon black product of claim 158, wherein

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical;

and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of a branched or

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

unbranched C₁-C₂₀ substituted alkyl, branched or unbranched C₃-C₂₀ unsubstituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6.

163. (Original) The carbon black product of claim 158, wherein said aromatic group is a group of the formula A_yAr, in which:

Ar is an aromatic radical selected from the group consisting of phenyl, naphthyl, anthryl, phenanthryl, biphenyl, and pyridyl;

y is an integer from 1 to 5 when Ar is phenyl, 1 to 7 when Ar is naphthyl, 1 to 9 when Ar is

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

anthryl, phenanthryl, or biphenyl, and 1 to 4 when Ar is pyridyl; and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, COOLi, COONa, COOK, COONR₄⁺, CN, NR₂, SO₃H, SO₃Li, SO₃Na, SO₃K, SO₃⁻, NR₄⁺, NR(COR), CONR₂, NO₂, PO₃HNa, PO₃Na₂, N=NR, N₂⁺X⁻, X⁻, PR₃⁺X⁻, S_kR, SOR, and SO₂R; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

wherein R is hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; and X⁻ is a halide or an anion derived from a mineral or organic acid.

164. (Original) The carbon black product of claim 158, wherein said aromatic group is a group of the formula A_yAr, in which:

Ar is an aromatic radical selected from the group consisting of phenyl, naphthyl, benzothiazolyl, and benzothiadiazolyl;

y is an integer from 1 to 5 when Ar is phenyl, 1 to 7 when Ar is naphthyl, 1 to 4 when Ar is

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

benzothiazolyl, and 1 to 3 when Ar is benzothiadiazolyl; and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of S_kR , SSO_3H , SO_2NRR' , SO_2SR , $SNRR'$, SNQ , SO_2NQ , CO_2NQ , $S-(1,4-piperazinediyl)-SR$, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl); and
- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C_1-C_{20} unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X^- is a halide or an anion derived from a mineral or organic acid; and Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$ or $(CH_2)_xS(CH_2)_z$, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6.

165. (Original) The carbon black product of claim 158, wherein

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical;

and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR),

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6.

166. (Original) The carbon black product of claim 165, wherein said aromatic group is a group of the formula A_yAr, in which:

Ar is an aromatic radical selected from the group consisting of phenyl, naphthyl, anthryl, phenanthryl, biphenyl, and pyridyl;

y is an integer from 1 to 5 when Ar is phenyl, 1 to 7 when Ar is naphthyl, 1 to 9 when Ar is anthryl, phenanthryl, or biphenyl, and 1 to 4 when Ar is pyridyl; and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, COOLi, COONa, COOK, COONR₄⁺, CN, NR₂, SO₃H, SO₃Li, SO₃Na, SO₃K, SO₃⁻, NR₄⁺, NR(COR), CONR₂, NO₂, PO₃HNa, PO₃Na₂, N=NR, N₂⁺X⁻, X⁻, PR₃⁺X⁻, S_kR, SOR, and

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

SO₂R; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

wherein R is hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; and X⁻ is a halide or an anion derived from a mineral or organic acid.

167. (Original) The carbon black product of claim 165, wherein said aromatic group is a group of the formula A_yAr, in which:

Ar is an aromatic radical selected from the group consisting of phenyl, benzothiazolyl, and benzothiadiazolyl;

y is an integer from 1 to 5 when Ar is phenyl, 1 to 4 when Ar is benzothiazolyl, and 1 to 3 when Ar is benzothiadiazolyl; and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of S_kR, SSO₃H, SO₂NRR', SO₂SR, SNRR', SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl); and
- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6.

168. (Original) A carbon black product comprising a carbon black and at least one organic group attached to the carbon black, wherein the organic group is an aromatic group of the formula A_yAr, wherein:

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical;

and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl, branched or unbranched C₃-C₂₀ unsubstituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

dithiolanyl), SOR, and SO₂R; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

169. (Original) The carbon black product of claim 168, wherein:

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl;

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic

U.S. Patent Application No. 10/806,080

Amendment dated November 17, 2006

Response to Office Action dated September 11, 2006

phosphonate salt, $N=NR$, $N_2^+X^-$, $NR_3^+X^-$, $PR_3^+X^-$, S_kR , SO_2NRR' , SO_2SR , $SNRR'$, SSO_3H , a SSO_3^- salt, SNQ , SO_2NQ , CO_2NQ , $S-(1,4-piperazinediyl)-SR$, $2-(1,3-dithianyl)$, $2-(1,3-dithiolanyl)$, SOR , and SO_2R ; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C_1-C_{20} unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X^- is a halide or an anion derived from a mineral or organic acid; and Q is $(CH_2)_w$, $(CH_2)_xO(CH_2)_z$, $(CH_2)_xNR(CH_2)_z$ or $(CH_2)_xS(CH_2)_z$ wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

170. (Original) The carbon black product of claim 168, wherein:

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical;

and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR_2 , SO_3H , a sulfonate salt, OSO_3H , OSO_3^- salts, $NR(COR)$, $CONR_2$, NO_2 , OPO_3H_2 , a monobasic or dibasic phosphate salt, PO_3H_2 , a monobasic or dibasic phosphonate salt, $N=NR$, $N_2^+X^-$, $NR_3^+X^-$, $PR_3^+X^-$, S_kR , SO_2NRR' , SO_2SR , $SNRR'$, SSO_3H , a SSO_3^- salt, SNQ , SO_2NQ , CO_2NQ , $S-(1,4-piperazinediyl)-SR$, $2-(1,3-dithianyl)$, $2-(1,3-$

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

dithiolanyl), SOR, and SO₂R; and

- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups and/or halogen(s);

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X' is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6;

and wherein Ar is optionally further substituted with alkyl(s) and/or halogen(s).

171. (Previously presented) The carbon black product of claim 168, wherein:

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical;

and

A, which can be the same or different when y is greater than 1, is a functional group selected from the group consisting of a branched or unbranched C₁-C₂₀ substituted alkyl, branched or unbranched C₃-C₂₀ unsubstituted alkyl, unsubstituted or substituted alkenyl, unsubstituted or substituted alkynyl, unsubstituted or substituted heteroaryl, unsubstituted or substituted alkylaryl, and unsubstituted or substituted arylalkyl.

172. (Original) The carbon black product of claim 168, wherein:

Ar is an aromatic or heteroaromatic radical;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical;

and

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, a carboxylate salt, CN, NR₂, SO₃H, a sulfonate salt, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, OPO₃H₂, a monobasic or dibasic phosphate salt, PO₃H₂, a monobasic or dibasic phosphonate salt, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SO₂NRR', SO₂SR, SNRR', SSO₃H, a SSO₃⁻ salt, SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR, and SO₂R; and
- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6, and w is 2 to 6.

173. (Original) The carbon black product of claim 168, wherein:

Ar is an aromatic radical selected from the group consisting of phenyl, naphthyl anthryl, phenanthryl, biphenyl, and pyridyl;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

- a functional group selected from the group consisting of OR, COR, COOR, OCOR, COOLi, COONa, COOK, COO⁺NR₄, CN, NR₂, SO₃H, SO₃Li, SO₃Na, SO₃K, SO₃NR₄⁺, NR(COR), CONR₂, NO₂, PO₃H₂, PO₃HNa, PO₃Na₂, N=NR, N₂⁺X⁻, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SOR, and SO₂R; and
- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one or more of said functional groups;

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; X⁻ is a halide or an anion derived from a mineral or organic acid.

174. (Original) The carbon black product of claim 168, wherein:

Ar is an aromatic radical selected from the group consisting of phenyl, benzothiazolyl, and benzothiadiazolyl;

y is an integer from 1 to the total number of -CH radicals present in the aromatic radical; and

A, which can be the same or different when y is greater than 1, is independently a substituent on the aromatic radical selected from:

- a functional group selected from the group consisting of S_kR, SSO₃H, SO₂NRR', SO₂SR, SNRR', SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl); and
- a linear, branched, aromatic, or cyclic hydrocarbon radical, substituted with one

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

or more of said functional groups;

wherein R and R', which can be the same or different, are hydrogen; branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl, or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl; k is an integer from 1 to 8; and Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein X is 1 to 6, z is 1 to 6, and w is 2 to 6.

175. (Original) A carbon black product comprising a carbon black and at least one organic group having a) an aromatic group and b) a cationic group, wherein at least one aromatic group of the organic group is attached to the carbon black and wherein the organic group is a N-substituted pyridinium group.

176. (Original) A carbon black product comprising a carbon black and at least one organic group ArOH attached to the carbon black, wherein Ar is arylene or heteroarylene.

177. (Original) A carbon black product comprising a carbon black and at least one organic group Ar(CH₂)_qS_k(CH₂)_rAr' attached to the carbon black, wherein Ar and Ar' are arylene, k is an integer from 1 to 8, and q and r are 0.

178. (Original) A carbon black product comprising a carbon black and at least one organic group Ar(CH₂)_qS_k(CH₂)_rAr' attached to the carbon black, wherein Ar and Ar' are heteroarylene, k is an integer from 1 to 8, and q and r are 0.

179. (Original) A process for preparing a carbon black product having an organic group attached to the carbon black comprising the step of:

reacting at least one diazonium salt with a carbon black in a protic reaction medium,

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

wherein the diazonium salt is generated in situ from the primary amine $H_2NArS_kArNH_2$ wherein Ar is benzothiazolylenes and k is 2.

180. (Original) A plastic composition comprising a plastic and the carbon product according to claim 154.

181. (Original) A paper product comprising paper pulp and the carbon product according to claim 154.

182. (Original) A fiber or textile composition comprising a fiber or textile and the carbon black product according to claim 154.

183. (Previously presented) An elastomer composition obtained by mixing at least one elastomer and the carbon black product according to claim 154.

184. (Original) The elastomer composition of claim 183, wherein the elastomer comprises at least one synthetic or natural polymer of 1,3-butadiene, styrene, isoprene, isobutylene, 2,3-dimethyl-1,3-butadiene, acrylonitrile, ethylene, or propylene.

185. (Original) The elastomer composition of claim 184, further comprising at least one additive selected from the group consisting of: a curing agent, a coupling agent, a processing aid, an oil extender, and an antioxidant.

186. (Previously presented) A cured elastomer composition obtained by curing the elastomer composition of claim 183.

187. (Previously presented) A rubber composition obtained by mixing a rubber and the carbon black product according to claim 154.

188. (Original) The rubber composition of claim 187, wherein the rubber comprises a natural rubber, a synthetic rubber, or mixtures of a natural and synthetic rubber.

189. (Original) The rubber composition of claim 188, wherein the rubber is selected from the

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

group consisting of:

copolymers of from about 10 to about 70 percent by weight of styrene and from about 90 to about 30 percent by weight of butadiene, polymers of conjugated dienes, and copolymers of conjugated dienes with ethylenic group-containing monomers.

190. (Original) The rubber composition of claim 189, wherein the rubber is a rubber selected from the group consisting of: polybutadiene, polyisoprene, polychloroprene, and poly(styrene-butadiene).

191. (Original) The rubber composition of claim 190, further comprising at least one additive selected from the group consisting of: a curing agent, a coupling agent, a processing aid, an oil extender, and an antioxidant.

192. (Currently amended) A cured rubber composition ~~obtainable~~ obtained by curing the rubber composition of claim 187.

193. (Original) A tire or tire component comprising the elastomer composition of claims 183.

194. (Original) A tire or tire component comprising the rubber composition of claims 187.

195. (Original) A method of decreasing the tan delta max at 70 deg C of an elastomer composition comprising the step of combining an elastomer with at least one carbon black product of claims 154.

196. (Original) The method of claim 195, further comprising forming the elastomer composition into a tire or tire component.

197. (Original) A method of increasing the abrasion resistance of an elastomer composition comprising the step of combining an elastomer with at least one carbon black product of claim 154.

198. (Original) The method of claim 197, further comprising forming the elastomer

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

composition into a tire or tire component.

199. (Previously presented) A carbon black product having attached to the carbon black an aliphatic group, which is substituted by a functional group selected from the group consisting of OR, COR, COOR, OCOR, COOLi, COONa, COOK, COO⁻ NR₄⁺, halogen, NR₂, SO₃H, sulfonate salts, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, PO₃H₂ phosphonate salts, phosphate salts, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SSO₃H, SSO₃⁻ salts, SO₂NRR', SO₂SR, SNRR', SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,3-dithiolanyl), SOR and SO₂R;

wherein R and R', which are the same or different, are hydrogen, branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl;

k is an integer from 1 to 8;

X⁻ is a halide or an anion derived from a mineral or organic acid; and

Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_x, wherein x is 1 to 6, z is 1 to 6 and w is 2 to 6.

200. (Previously presented) A carbon black product having attached to the carbon black a cyclic group selected from cyclic organic groups, alicyclic hydrocarbon groups and heterocyclic hydrocarbon groups, which is substituted by a functional group selected from the group consisting of R, OR, COR, COOR, OCOR, carboxylate salts, halogen, CN, NR₂, SO₃H, sulfonate salts, OSO₃H, OSO₃⁻ salts, NR(COR), CONR₂, NO₂, PO₃H₂, phosphonate salts, phosphate salts, N=NR, NR₃⁺X⁻, PR₃⁺X⁻, S_kR, SSO₃H, SSO₃⁻ salts, SO₂NRR', SO₂SR, SNRR', SNQ, SO₂NQ, CO₂NQ, S-(1,4-piperazinediyl)-SR, 2-(1,3-dithianyl), 2-(1,2-dithiolanyl), SOR

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

and SO_2R ;

wherein R and R₁, which are the same or different, are hydrogen, branched or unbranched C₁-C₂₀ unsubstituted or substituted alkyl, alkenyl or alkynyl; unsubstituted or substituted aryl; unsubstituted or substituted heteroaryl; unsubstituted or substituted alkylaryl; or unsubstituted or substituted arylalkyl;

k is an integer from 1 to 8;

X⁻ is a halide or an anion derived from a mineral or organic acid; and

Q is (CH₂)_w, (CH₂)_xO(CH₂)_z, (CH₂)_xNR(CH₂)_z or (CH₂)_xS(CH₂)_z, wherein x is 1 to 6, z is 1 to 6 and w is 2 to 6.

201. (Previously presented) An elastomer composition obtained by mixing at least one elastomer and the carbon black product according to claim 199.
202. (Previously presented) An elastomer composition obtained by mixing at least one elastomer and the carbon black product according to claim 200.
203. (Previously presented) A fiber or textile composition comprising a fiber or textile and the carbon black product according to claim 199.
204. (Previously presented) A fiber or textile composition comprising a fiber or textile and the carbon black product according to claim 200.
205. (Previously presented) A plastic composition comprising a plastic and the carbon product according to claim 199.
206. (Previously presented) A plastic composition comprising a plastic and the carbon product according to claim 200.
207. (Previously presented) A paper product comprising paper pulp and the carbon product according to claim 199.

U.S. Patent Application No. 10/806,080
Amendment dated November 17, 2006
Response to Office Action dated September 11, 2006

208. (Previously presented) A paper product comprising paper pulp and the carbon product according to claim 200.
209. (Previously presented) An aqueous ink comprising an aqueous ink solvent and the carbon black product of claim 199.
210. (Previously presented) An aqueous ink comprising an aqueous ink solvent and the carbon black product of claim 200.
211. (Previously presented) An aqueous coating comprising an aqueous coating solvent and the carbon black product of claim 199.
212. (Previously presented) An aqueous coating comprising an aqueous coating solvent and the carbon black product of claim 200.